Research Note

Exercise Intensity and Rate of Perceived Exertion of Folk Dance

甲斐　久実代[1)]　　坂口　結子[2)]
Kumiyo KAI, Yuko SAKAGUCHI

1) 日本福祉大学　スポーツ科学部
Faculty of Sports Sciences, Nihon Fukushi University

2) 日本福祉大学スポーツ科学センター
Nihon Fukushi University Center of Sports Sciences

Abstract

Dance promotes physical, social and mental health. A review of effectiveness of dance intervention stated dance could be recommended as a safe form of physical activity to promote health and fitness. Folk dance has been performed as a physical, social and cultural activity worldwide. Japanese national curriculum of physical education requires teaching folk dance in addition to rhythmic dance and expressive dance. The purpose of this research was to measure exercise intensity of folk dance and evaluated if it met the recommended exercise intensity level by American College of Sports Medicine (ACMS) guideline. We calculated maximum heart rate (%HRmax) and heart rate reserve (%HRR) by heart rate (HP) monitoring with a heart rate monitor (Polar, RC3GPS) and a perceived exertion (RPE) was reported in performing a folk dance (Virginia Reel).

The average HR of folk dance was 118.9±7.2bpm, %HHR was 39.0±4.4%, %HRmax was 59.5±3.5% and RPE was 13.1±1.2 in scale 6-20. According to ACSM guideline, this folk dance was reported as very light to vigorous and did not always meet recommended exercise intensity by ACSM. Rating of perceived exertion, tempo of music, choreography, especially frequent use of arms and jumping have to be carefully examined in order to achieve positive effects of folk dance to improve fitness level.

Keywords : exercise intensity, folk dance, dance science, exercise prescription

1. Introduction

Physical activity provides various health benefits and prevents sever life-related diseases[1]. Despite the benefits of physical activity, the number of people who are involved in regular physical activity is small. Japanese Ministry of Health, Labour and Welfare reported only 35.9% of male and 28.6% of female were involved in a regular physical activity and addressed the need to increase female participation in a regular physical activity[2]. Governmental body, educational, health institutions have been promoting physical activity throughout life span. They encourage providing opportunities to be exposed to a variety of physical activities from children to the elderly[1].

Dance promotes physical, social and mental health. Researches address dance improves cardiovascular endurance, flexibility, and balance[3-5]. The recent review of effectiveness in dance intervention stated dance could be recommended as a safe form of physical activity to improve cardiovascular fitness and functionality[6].

Research addressing physical health aspects of dance is often limited to professional dancers or theatrical form of dance such as ballet and modern[7,8]. Folk dance has been performed as a physical, social and cultural activity worldwide. Japanese national curriculum of physical education requires teaching folk dance in addition to rhythmic dance and expressive dance[9].

To achieve positive effects of physical activity, American College of Sports Medicine (ACSM) provides an evidence-based guideline for exercise prescription. Frequency, intensity, time, and type need to be considered when prescribing a physical activity[10].

The purpose of this study was to measure exercise intensity of folk dance and evaluated if it met the recommended exercise intensity by ACSM guideline. We focused on measuring exercise intensity of folk dance for this research. Because of the nature of choreographed dance, time and type of a dance are set by an original choreographer, therefore non-changeable. Folk dance is required to teach in the subject of physical education or performing arts in many countries. However, the published information on physiological characteristics of this genre of dance is little. Measuring exercise intensity of folk dance is a necessary step to understand if this wide performed dance could be beneficial to promote health.

Therefore, we measured a heart rate (HR) and a perceived exertion while performing a folk dance (Virginia Reel). We calculated exercise intensity and evaluated if this folk dance met the recommended intensity level by ACSM guideline.

2. Method

7 female university students (average age 21.4 years old) volunteered for the study. No participants involved in a regular physical activity except a 1.5-hour physical activity class they all attended once a week at university. All participants signed an informed consent form approved by the Ethics Committee of Nagoya Women's University (No. 26-8). No participants had any current injuries. Participants wore regular gym clothes and shoes. 10-minute instructional session for choreography of folk dance "Virginia Reel" was taught by a dance instructor prior to a testing for participants' safety. The choice of folk dance was based on the lists of folk dance from Japanese National Curriculum of PE, Teaching Guideline in Health and Physical Education 2017[9]. Movement sequence of folk dance "Virginia Reel" was shown in Figure 1.

Participants were tested in indoor auditorium. Each participant lay in a quiet place for 10 minutes to assess a resting HR before trial. HR was recorded before and throughout trial using a heart rate monitor (Polar, RC3GPS).

All participants performed dancing folk dance "Virginia Reel" with music in a group. Duration and tempo of the music was 7 minutes and 30 seconds and 116bpm, respectively.

To calculate exercise intensity, we used maximum heart rate (%HRmax) and heart rate reserve (%HRR).

%HRmax was calculated by using following formula;

First of all, HRmax could be estimated as a number of 220-age …(1-1)

%HRmax = HR / HRmax*100 …(1-2)

Estimated exercise intensity as %HRR was calculated by using Karvonen formula for

determining target HR;

Using this formula, we calculated %HRR as follows;

%HRR = (HR - HRrest) / (HRmax - HRrest) *100 …(2)

Perceived exertion was measured by the Borg Rating of Perceived Exertion (RPE) scale 6-20. Each participant was asked to check a scale out of 6-20 in RPE after the trial.

Average and standard deviation (±) of %HRmax, %HRR, and RPE were calculated. We evaluated exercise intensity level of each measurement by ACSM guideline. The exercise intensity was colored if the exercise intensity was very light in blue, light in yellow, moderate in pink, vigorous in green by ACSM guideline.

Movement sequence	Time (min' sec")	Movements
No.1 	0 -10"	Stand face to a partner
No.2 	11-22"	Skip towards a partner
No.3 	23-32"	Skip forward with arms bend Turn around and skip backwards
No.4 	33-39"	Skip around with a partner holding right hands, left hands, and both hands
No.5  	39"-1'04"	A couple as a lead crossing opposite arms and skipping around together then change partner along a line, come back to the original partner, continue this part until an end of a line
No.6 	1'05-1'17"	The lead make an arch, other participants go through the arch
Repeat No.1 to No.6	1'18"-	Repeat movement sequence No. 1 to No. 6, 6 times while a lead taking turns

Figure 1. Movement sequence of folk dance

3. Result

Figure 2 showed a typical HR during folk dance. Table 1 showed each participant's data of HRrest, HRmax, exercise intensity of %HRR, and %HRmax and RPE. The average HR of folk dance was 118.9 ± 7.2 bpm, %HHR was 39.0 ± 4.4%, %HRmax was 59.5 ± 3.5%. The average RPE of dance was 13.1 ± 1.2 in scale 6-20. According to ACSM guideline, this folk dance was light to moderate in %HRR, very light to light in %HRmax, and light to vigorous in RPE and did not fully met its recommended level of exercise intensity (moderate to vigorous). 5 Participants (71.4%) reported the exercise intensity level of RPE higher than that of %HRR and %HRmax.

4. Discussion

We measured HR while performing a folk dance (Virginia Reel). According to ACSM guideline, this folk dance was reported as very light to vigorous (light to moderate in %HRR and very light to light in HRmax, light to vigorous in

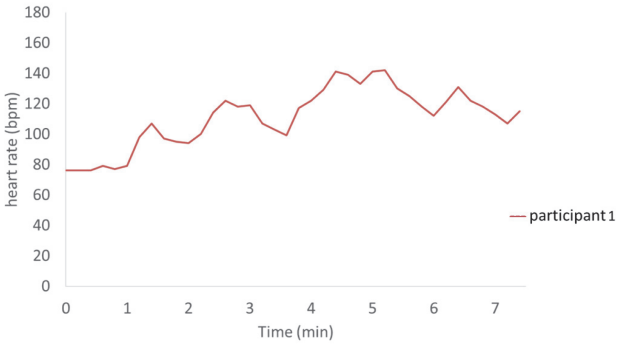

Figure 2. Heart rate during folk dance

	HRrest (bpm)	HRmax (bpm)	%HRR (%)	%HRmax (%)	RPE (scale 6-20)
Subject 1	60	200	37.1	56.0	13
Subject 2	76	200	37.1	61.0	15
Subject 3	76	200	39.3	62.4	13
Subject 4	69	200	38.4	59.7	14
Subject 5	60	200	42.9	60.0	11
Subject 6	66	200	45.9	63.7	13
Subject 7	66	199	32.2	53.9	13

Very light　Light　Moderate　Vigirous

Table 1. Heart rate and exercise intensity

RPE) and did not fully met its recommended exercise intensity level of physical activity.

Although this folk dance did not necessarily meet moderate intensity level, performing folk dance in this intensity level might be beneficial for some population. ACSM and American Heart Association recommend for healthy adults aged 18 to 65 years participating moderate intensity aerobic physical activity for a minimum of 30 minutes on five days each week or vigorous intensity aerobic physical activity for a minimum of 20 minutes on three days each week to promote and maintain health[10, 11]. This folk dance did not meet the exercise intensity they recommended. However, ACSM also stated that performing some exercise could be beneficial even if one did not meet the recommended target especially for those who were inactive[10]. UK study of national survey focusing on girls in sport showed dance was preferred type of physical activity for females who had less experience in physical activity[12]. Females who had dropped out other type of physical activity continued dancing and were inclined to engage in dance programs[13]. Other study reported females significantly improved more in aerobic fitness and flexibility than males in dance program[14]. Dance intervention study of the elderly stated dance was a favorable physical activity since dance was practiced in a group, non-competitive, and music as an enjoyment factor of physical activity[15, 16]. This folk dance could be a good promotion for females with little experience in physical activity and the elderly to be engaged in and continue physical activity.

Previous study measuring exercise intensity of folk dance reported higher intensity than this study. Miura et al. reported exercise intensity of folk dances in %VO2max ranged from 73.8 to 85.9 %[17], which falls moderate to vigorous in intensity of ACSM guideline. This was because of the differences in 1) tempo of folk dance, 2) total time of trials, and 3) measurement of exercise intensity between their study and ours. The choice of music was faster than our study. The tempos of their folk dance were 138-170bpm while ours was 116bpm. Folk dance in their study performed twice or three times to meet their minimum trial time of 15 minutes while folk dance in this study performed only once and it was half of their performance time.

Studies of exercise intensity in dance mentioned other factors resulted in increase of exercise intensity and those were; a use of arms over head[18], frequency of jumping[17], number of people in dance, and level of training[7]. In order to achieve positive effects of folk dance to improve fitness level, choreography of folk dance, especially a use of arms and jumping has to be examined.

The exercise intensity of RPE was reported higher than that of %HRR or %HRmax in ACSM guideline. RPE could be affected by external environmental factors. In this folk dance, participants danced with multiple partners and faced multiple directions. Although partnering and group activity were considered as preferable characteristic for engagement in regular physical activity[15], we need to keep in mind one's rating of perceived exertion might be overestimated than exercise intensity of %HRR or %HRmax. In the movement sequence of this folk dance, participants skipped around and faced multiple directions in a room. Their cognitive function and process might be challenged and resulted in choosing a higher level of RPE after the trial.

In this study, we only had 7 female participants from a same age category. Study of measuring exercise intensity between genders concluded there was a significant difference in physiological response to dance between genders[19]. For future

study to understand positive effectiveness of folk dance as an exercise intervention to promote fitness, we need to recruit more participants from various generations and gender. Results of HR in our study were lower than previous studies calculating exercise intensity from VO2max. Although hear rate monitor is portable and cost effective, adding other measurement of exercise intensity might be helpful.

For future research, participants, a measurement of HR, a choice of music tempo and total time of trial have to be carefully determined.

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